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(54) **Multifunctional keyboards with changeable keytop indicia**

(57) The key tops of a keyboard for general purpose use of input of textual data to an electronic computer has embedded in the surface of the key tops a liquid crystal display, or similar solid state display device, which can display letter, symbol or pictorial data. Such a miniature display device in each key top allows, under the control of a microprocessor which holds the symbol data in memory, symbols to be displayed or varied at short notice. This allows several character sets to be presented on a keyboard in for instance the QWERTY layout for English, or AZERTY layout for French, or as several selectable parts of Chinese keyboards on just one keyboard. The desired section of a language set is brought into view by holding down the appropriate 'shift' key. In effect the one keyboard can display one of several virtual keyboards that are 'out of view' until that virtual keyboard is brought into 'view'.

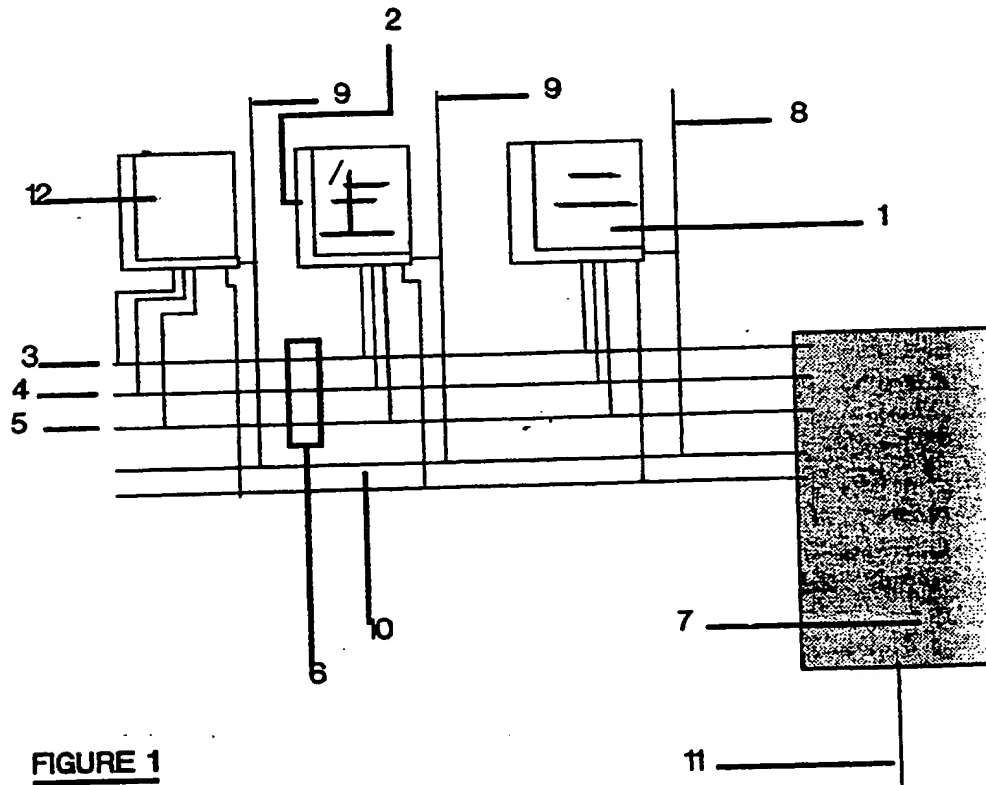


FIGURE 1

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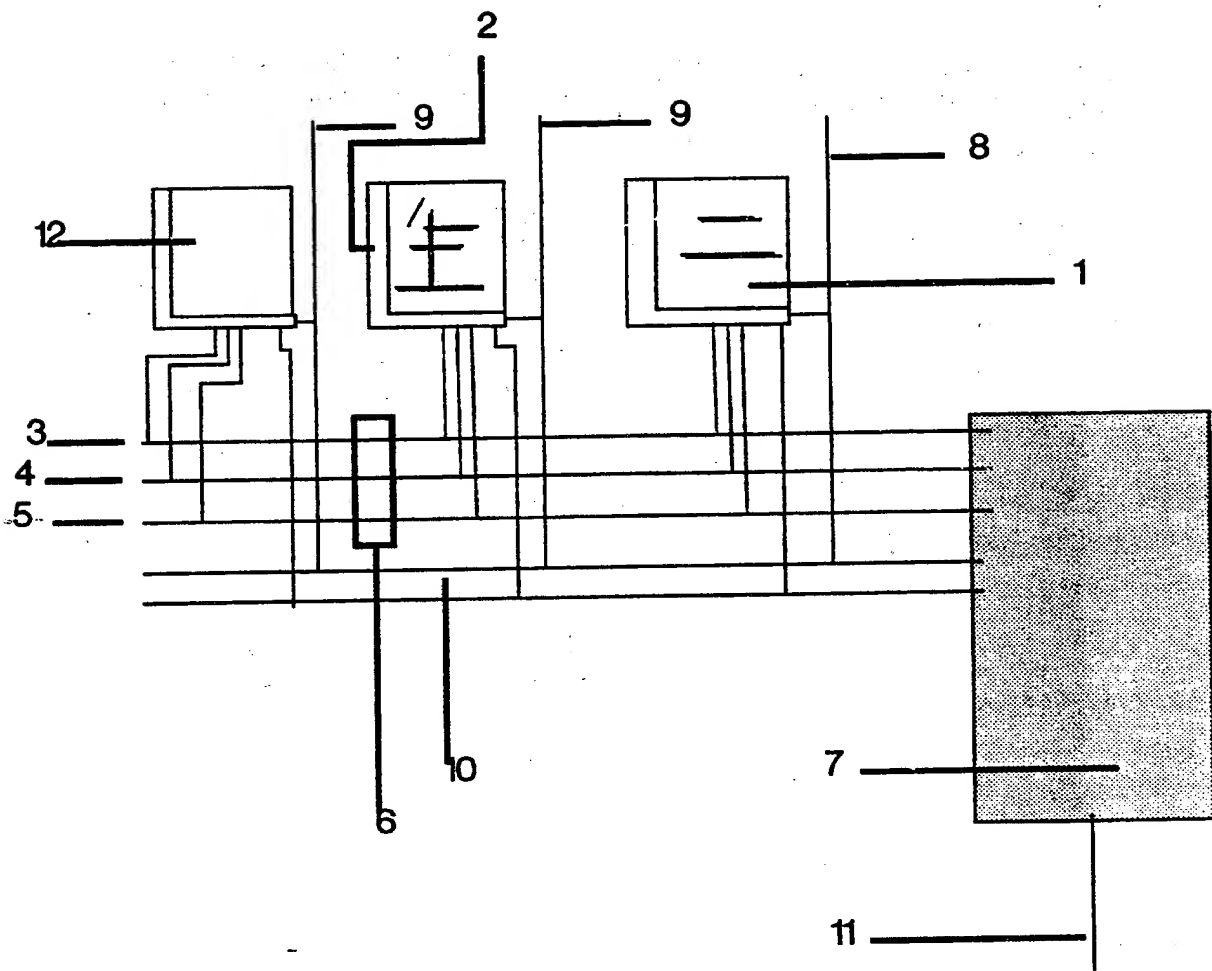


FIGURE 1

Dynamically changeable key tops for computer processed keyboard input

This invention relates to a keyboard that can be electronically switched to display the appropriate lettering of any language by the computer to which it is connected.

Keyboards are the standard way of inputting textual data to electronic computers. The computer displays its output to the person using it on a visual display screen or teletype roll. The keyboards used are of a fairly standard nature but usually specifically engineered for use in a particular country or for a specific application. When used for textual input, the keyboard will vary from country to country in a slight or major way. For instance, a keyboard for input of English character data will be very much simpler than one for the Japanese character set. The English character set is composed of a to z, A to Z and 0 to 9 as well as various punctuation marks. However in the Chinese character set, strokes represent characters or phonetic symbols. To represent a major section of the Chinese full character set, as printed by hand, as well as offering the stroke construction method, does require a very large keyboard of key tops. A Chinese typewriter is an example of this. Each key top represents either a stroke that may be built up into a character by overtyping or a fully formed character, such as the character for 'man'.

Additionally, even within a single range of keyboards available from one supplier of one brand of computers, the keyboards needed for each range of computers and/or applications can vary considerably.

This invention removes the previously mentioned constraints to provide a single keyboard for connection to a computer and its visual display unit. The keyboard's key tops are dynamically changeable in that the computer can either specify what character or symbol set is to be displayed on each respective key top. Alternatively the keyboard can be preset with a subset of characters and manually switched to display a particular set of characters in one of the languages. For example, one moment the English character set may be displayed, and the next the French character set.

The principle of this invention is to display on the keyboard's key tops, eg: 1 of figure 1, the symbol that would be in that position of the board for the selected language. The key top, 1 of figure 1, is composed of a symbol display device, 2 of figure 1, that is visible to the person using the keyboard. A suitable display built into each board would be a liquid crystal display, LCD for short, and its associated thin film electronic driver. All the LCDs in each of the key tops are connected to one electronic bus, 6 of figure 1, in the keyboard. This in turn is driven by a microprocessor, 7 of figure 1, which displays on each key top the appropriate symbol or character for the appropriately pressed shift key. A default set of symbols are displayed if none of the 'shift to another case' keys are being held down. The default set might be upper case English characters, and one shift may cause the lower case letters to be displayed. So if shift key 1, 12 of figure 1, is held down all the other key tops on the board display one range of the Cantonese Chinese character set. This happens so rapidly that the person using the keyboard notices only a quick changeover to each character set being displayed on the board. The person can pick the appropriate character of interest by moving round the shift keys to see where that character or letter is displayed. The person then presses that key top and the microprocessor, 7 of figure 1, encodes the represented character or letter with a unique code or codes. The unique code sequence is then forwarded in the usual manner to the host computer, 11 of figure 1, driving the visual display unit.

Further to this, the host computer can send the language codes for each character or letter and also a set of codes to form each character on the key tops. So that the key top display for each language can be held on the host computer. The local keyboard's microprocessor then uses the information to display via the LCD each key top's character, letter, symbol or picture. Each shift key as pressed invokes another range of the full character set. In effect the full character set of say Chinese is displayed in sections by holding down the appropriate shift key that causes that section to be displayed, or come to into view.

The remaining structure of the keyboard is the same as those currently in use. That is, the key pressed is detected by the microprocessor by the electronically multiplexed X and Y lines, 8, 9, 10 of figure 1. When a key is pressed the appropriate intersecting X and Y lines are connected. The microprocessor can then determine the key that is pressed, and with reference to the shift key in use, what character that key top is displaying. It then issues the corresponding code or codes to the host computer that represents the character.

Details of key numbers in figure 1

- (1) Back lit LCD of a Chinese character
- (2) Electronic driver for the LCD which is uniquely addressed by the microprocessor
- (3) Positive power supply
- (4) Negative power supply
- (5) For serially encoded digital data to the LCD placed on this signal rail
- (6) All three wires of the bus are linked to all the other key tops
- (7) Microprocessor and associated memory and driver devices to control the LCD's on each key top. Each key top's LCD is uniquely identified and no other is selected while one is being updated with the symbol to display. The microprocessor multiplexes all the keys looking for the one or more that is being pressed, as well as causing each LCD on each key top to keep displaying the currently selected symbols
- (8) (X,Y) key pressed line
- (9) (X,Y) key pressed line
- (10) (X,Y) key pressed line
- (11) Connection to the host computer that drives the visual unit to which the keyboard is associated
- (12) A 'shift' to another case or character set

CLAIMS

1. The key tops of the keyboard as used for computer input of textual or pictorial data have the letters, symbols or pictures displayed on the key tops via an electronic solid state device such as a liquid crystal display, and the symbols can be dynamically changed for the sole purpose of showing the currently selected symbol set in a particular key layout by a microprocessor that drives the key top displays and encodes the then pressed keys with codes recognised or agreed by the host computer driving the visual display associated with the keyboard.
2. The keyboard's key tops each have an integrated display device and each is individually addressable by the controlling microprocessor for the purpose of displaying a unique but instantaneously changeable symbol as well as for detecting which key top is pressed by a person using the keyboard.